

IN THE CLAIMS:

Please ADD new claims 29-42, as follows. For the Examiner's convenience, all claims currently pending in this application have been reproduced below:

1. (Previously Presented) A measuring system for measuring performance of an imaging optical system, said measuring system comprising:

an interferometer for measuring transmission wavefronts, in relation to at least one of plural measurement points defined along a plane perpendicular to an optical axis of the imaging optical system; and

a computing unit for calculating an imaging state of the imaging optical system on the basis of information regarding the transmission wavefronts measured by said interferometer and the position coordinates of the plural measurement points, and said computing unit calculating said imaging state at each measurement point, while taking, as a reference, an imaging state at a standard point set along a plane perpendicular to the optical axis.

2. (Original) A measuring system according to Claim 1, wherein the measurement of a transmission wavefront and position coordinates with respect to the standard point is performed plural times more than the measurement of the transmission wavefront and position coordinates with respect to another measurement point.

3. (Previously Presented) A measuring system according to Claim 2, wherein the measurement of the transmission wavefront and position coordinates with respect to the standard point is performed simultaneously and every time the measurement of the transmission wavefront and position coordinates with respect to another measurement point is performed.

4. (Original) A measuring system according to Claim 1, wherein the standard point is an object point and an image point on the optical axis of the imaging optical system.

5. (Original) A measuring system according to Claim 1, wherein the position coordinates of the measurement point concern a relative coordinate system with respect to the position coordinates of the standard point.

6. (Original) A measuring system according to Claim 1, wherein the optical system for measurement of the standard point is provided separately from an optical system for measurement of the other measurement point.

7. (Previously Presented) A measuring system according to Claim 6, wherein the optical system for measurement of the other measurement point is movable at the object plane side and the image plane side and the optical system has a laser interferometer for monitoring the position coordinates thereof.

8. (Previously Presented) A measuring system according to Claim 6, further comprising optical systems for measurement of the other measuring points, the number of which corresponds to the number of the measurement points.

9. (Original) A measuring system according to Claim 1, wherein the measurement with respect to the standard point and the other measurement points is carried out by use of one and the same optical system.

10. (Previously Presented) A measuring system according to Claim 9, wherein the same optical system for measurement of the standard point and the measurement point is movable at the object plane side and the image plane side, and further comprising a laser interferometer for monitoring the moved position coordinates.

11. (Original) A measuring system according to Claim 1, wherein, in an optical system for the other measurement point, a chief ray of light impinging on the measurement points is registered with a direction of a chief ray of the imaging optical system.

12. (Original) A measuring system according to Claim 1, wherein the imaging state includes distortion and curvature of field.

13. (Previously Presented) A projection exposure apparatus for performing projection exposure by use of an imaging optical system, said apparatus comprising:

an imaging optical system;

an interferometer for measuring transmission wavefronts in relation to at least one of plural measurement points defined along a plane perpendicular to an optical axis of the imaging optical system; and

a computing unit for calculating an imaging state of the imaging optical system on the basis of information regarding the transmission wavefronts measured by said interferometer and the position coordinates of the plural measurement points and said computing unit calculating said imaging state at each measurement point, while taking, as a reference, an imaging state at a standard point set along a plane perpendicular to the optical axis.

14. (Previously Presented) A measuring system for measuring performance of an imaging optical system, said measuring system comprising:

an interferometer for measuring transmission wavefronts in relation to at least one of plural measurement points defined along a plane perpendicular to an optical axis of the imaging optical system; and

a computing unit for calculating at least one of distortion and curvature of field of the imaging optical system on the basis of information regarding the transmission wavefronts measured by said interferometer and the position coordinates of plural measurement points and said computing unit calculating at least one of the distortion and curvature of field at each

measurement point, while taking, as a reference, at least one of distortion and curvature of field at a standard point set along a plane perpendicular to the optical axis.

15. (Previously Presented) A measuring system according to Claim 14, wherein a result of the measurement of distortion and curvature of field with respect to the other measurement point is complemented on the basis of a result of measurements made plural times to the distortion and the curvature of field with respect to the standard point.

16. (Original) A measuring system according to Claim 14, wherein the standard point is an object point and an image point on the optical axis of the imaging optical system.

17. (Original) A measuring system according to Claim 14, wherein the position coordinates of the measurement point concern a relative coordinate system with respect to the position coordinates of the standard point.

18. (Previously Presented) A measuring system according to Claim 14, wherein correction of a change of distortion and curvature of field with respect to time is carried out by subtracting the amount of change from the measured values of them.

19. (Original) A measuring system according to Claim 14, wherein an optical system for measurement of the standard point is provided separately from an optical system for measurement of the other measurement point.

20. (Original) A measuring system according to Claim 19, wherein the optical system for measurement of the other measurement point is movable at the object plane side and the image plane side and the optical system has a laser interferometer for monitoring the position coordinates thereof.

21. (Previously Presented) A measuring system according to Claim 19, further comprising optical systems for the other measurement points, of a number the same as the measurement points.

22. (Original) A measuring system according to Claim 14, wherein the measurement with respect to the standard point and the other measurement points is carried out by use of one and the same optical system.

23. (Previously Presented) A measuring system according to Claim 22, wherein the same optical system for measurement of the standard point and the measurement point is movable at the object plane side and the image plane side, and further comprising a laser interferometer for monitoring the moved position coordinates.

24. (Original) A measuring system according to Claim 14, wherein, in an optical system for the other measurement point, a chief ray of light impinging on the measurement points is registered with a direction of a chief ray of the imaging optical system.

25. (Previously Presented) A projection exposure apparatus for performing projection exposure by use of an imaging optical system, said apparatus comprising:

an imaging optical system;

an interferometer for measuring transmission wavefronts in relation to at least one of plural measurement points defined along a plane perpendicular to an optical axis of the imaging optical system; and

a computing unit for calculating at least one of distortion and curvature of field of the imaging optical system on the basis of information regarding the transmission wavefronts measured by said interferometer and the position coordinates of the plural measurement points and said computing unit calculating at least one of the distortion and curvature of field at each measurement point, while taking, as a reference, at least one of distortion and curvature of field at a standard point set along a plane perpendicular to the optical axis.

26. (Previously Presented) A method of measuring performance of an imaging optical system, said method comprising the steps of:

measuring, by use of an interferometer, transmission wavefronts in relation to at least one of plural measurement points defined along a plane perpendicular to an optical axis of the imaging optical system;

calculating an imaging state of the imaging optical system on the basis of information regarding the transmission wavefronts measured in said measuring step and the positions coordinates of the plural measurement points; and

calculating said imaging state at each measurement point, while taking, as a reference, an imaging state at a standard point set along a plane perpendicular to the optical axis.

27. (Previously Presented) A method of measuring performance of an imaging optical system, said method comprising the steps of:

measuring, by use of an interferometer, transmission wavefronts in relation to at least one of plural measurement points defined along a plane perpendicular to an optical axis of the imaging optical system;

calculating at least one of distortion and curvature of field of the imaging optical system on the basis of information regarding the transmission wavefronts measured in said measuring step and the position coordinates of the plural measurement points; and

calculating at least one of the distortion and curvature of field at each measurement point, while taking, as a reference, at least one of distortion and curvature of field at a standard point set along a plane perpendicular to the optical axis.



28. (Previously Presented) A measuring system for measuring performance of an imaging optical system, said measuring system comprising:

an interferometer for measuring transmission wavefronts of the imaging optical system with respect to at least one of plural measurement points which are defined along a plane perpendicular to an optical axis of the imaging optical system; and

a computing unit for calculating an imaging state of the imaging optical system, on the basis of information regarding transmission wavefronts as measured by said interferometer, said computing unit calculating an imaging state with respect to a measurement point, while taking, as a reference, an imaging state at another measurement point being set along a plane perpendicular to the optical axis.

29. (New) A measuring system for measuring performance of an imaging optical system, said measuring system comprising:

an interferometer for measuring transmission wavefronts, in relation to at least one of plural measurement points defined along a plane perpendicular to an optical axis of the imaging optical system; and

a computing unit for calculating wavefront aberration of the imaging optical system on the basis of information regarding the transmission wavefronts measured by said interferometer and position coordinates of the plural measurement points, said computing unit calculating the wavefront aberration at each measurement point while taking, as a reference, the wavefront aberration at a standard point set along a plane perpendicular to the optical axis.

30. (New) A measuring system according to Claim 29, wherein the measurement of a transmission wavefront and position coordinates with respect to the standard point is performed a plurality of times more than the measurement of the transmission wavefront and position coordinates with respect to another measurement point.

31. (New) A measuring system according to Claim 30, wherein the measurement of the transmission wavefront and position coordinates with respect to the standard point is performed simultaneously and every time the measurement of the transmission wavefront and position coordinates with respect to another measurement point is performed.

32. (New) A measuring system according to Claim 29, wherein the standard point is an object point and an image point on the optical axis of the imaging optical system.

33. (New) A measuring system according to Claim 29, wherein the position coordinates of the measurement point concern a relative coordinate system with respect to the position coordinates of the standard point.

34. (New) A measuring system according to Claim 29, wherein an optical system for measurement of the standard point is provided separately from an optical system for measurement of the other measurement point.

35. (New) A measuring system according to Claim 34, wherein the optical system for measurement of the other measurement point is movable at the object plane side and the image plane side, and the optical system has a laser interferometer for monitoring the position coordinates thereof.

36. (New) A measuring system according to Claim 34, further comprising optical systems for measurement of the other measuring points, the number of which corresponds to the number of measurement points.

37. (New) A measuring system according to Claim 29, wherein the measurement with respect to the standard point and the other measurement points is carried out by use of one and the same optical system.

38. (New) A measuring system according to Claim 37, wherein the same optical system for measurement of the standard point and the measurement point is movable at the object plane side and the image plane side, and further comprising a laser interferometer for monitoring the moved position coordinates.

39. (New) A measuring system according to Claim 29, wherein, in an optical system for the other measurement point, a chief ray of light impinging on the measurement points is registered with a direction of a chief ray of the imaging optical system.

40. (New) A measuring system according to Claim 29, wherein the imaging state includes distortion and curvature of field.

41. (New) A projection exposure apparatus for performing projection exposure by use of an imaging optical system, said apparatus comprising:

an imaging optical system;

an interferometer for measuring transmission wavefronts in relation to at least one of plural measurement points defined along a plane perpendicular to an optical axis of the imaging optical system; and

a computing unit for calculating wavefront aberration of the imaging optical system on the basis of information regarding the transmission wavefronts measured by said interferometer and the position coordinates of the plural measurement points, said computing unit calculating the wavefront aberration at each measurement point, while taking, as a reference, the wavefront aberration at a standard point set along a plane perpendicular to the optical axis.

42. (New) A method of measuring performance of an imaging optical system, said method comprising the steps of:

measuring, by use of an interferometer, transmission wavefronts in relation to at least one of plural measurement points defined along a plane perpendicular to an optical axis of the imaging optical system;

calculating wavefront aberration of the imaging optical system on the basis of information regarding the transmission wavefronts measured in said measuring step and the position coordinates of the plural measurement points; and

calculating the wavefront aberration at each measurement point, while taking, as a reference, the wavefront aberration at a standard point set along a plane perpendicular to the optical axis.